

## REMARKS/ARGUMENTS

### **Claim Status**

Claims 1-12 and 14-17 are pending. Claim 1 has been amended to include the subject matter of claim 13 (field-effect mobility) as well as to incorporate specific listings of what “substituents” are being claimed for the R groups (support: pages 9-12 of the specification). Claim 1 is also amended to exclude the instance of formula I being indolizine (support: page 12, line 23, to page 13, line 2)<sup>1</sup>. Claim 13 is currently canceled without prejudice. No new matter is believed to have been entered.

### **§112 Rejection**

Claims 1-8 are rejected under 35 U.S.C. §112, 1<sup>st</sup> paragraph, for lack of enablement with respect to all possible “substituents” of the recited R groups. As explained above (“Claims Status”), independent claim 1 has been amended to incorporate specific listings of what “substituents” are being claimed for the R groups (support: pages 9-12 of the specification). As this type of amendment has been suggested by the Examiner as a way to obviate this rejection (see Office Action, page 5, lines 14-17), Applicants believe the above-mentioned amendment has overcome this rejection. Accordingly, Applicants request withdrawal of the §112 rejection.

### **§103(a) Rejections**

Claims 1, 3-10, 12, 14 and 17 are again rejected under 35 U.S.C. §103(a) as obvious in view of *Jackson* (US 6,720,572), *Klauk* (Solid-State Electronics, Vol. 47, pgs. 297-301) and *Ueda* (US 6,420,057). Additionally, claims 1, 2 and 9-17 are newly rejected under 35

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<sup>1</sup> See M.P.E.P. 2173.05(i) referencing *In re Johnson*, 558 F.2d 1008, 1019, 194 USPQ 187, 196 (CCPA 1977) (“If alternative elements are positively recited in the specification, they may be explicitly excluded in the claims”).

U.S.C. §103(a) as obvious in view of *Klauk* and *Hanna* (WO 03-080732). Applicants respectfully traverse these rejections.

A. With respect to the new rejection over *Klauk* and *Hanna*, Applicants note that amended claim 1 excludes formula I from being indolizine. The Office has relied upon *Hanna* for its sole disclosure of indolizine; however, *Hanna* does not disclose or suggest any additional heterocyclic compounds that fall within the scope of formulas I - VII as defined in independent claim 1. Accordingly, as *Hanna* does not disclose or suggest compounds within the scope of amended claim 1, and it has previously been established that *Klauk* does not disclose or suggest compounds within the scope of amended claim 1 (see previous Office Actions), the combination of *Hanna* and *Klauk* does not render obvious the claimed invention.

B. With respect to the maintained rejection over *Jackson*, *Klauk* and *Ueda*, Applicants offer the following remarks.

The Office has taken the position that it would have been obvious to one skilled in the art to take the organic thin film transistor of *Jackson* and set the channel length (i.e., “distance between the source electrode and the drain electrode”) to 5-100 micrometers as disclosed by *Klauk* and to then incorporate the heterocyclic compounds as disclosed by *Ueda* as the light emitting material of the organic semiconductor layer.

Applicants note that the heterocyclic compounds disclosed by *Ueda* (i.e., formulas III-VIII) are used as “a salt of the anion of a compound represented by Formula [III-VIII] and a metal cation” (see col. 2, lines 66-67; col. 3, lines 22-23 and 45-46; col. 4, lines 1-2, 22-23 and 44-45). Therefore, *Ueda* discloses the heterocyclic compounds as the intermediates of the desired salts. *Ueda* is silent with respect to incorporating such “intermediates” in the light

emission layer of the organic electroluminescent element. Therefore, one skilled in the art considering the *Ueda* and *Jackson* references would, questionably at best, incorporate the salts of the heterocyclic compounds as disclosed by *Ueda* in columns 13-77 as the light emitting material of the organic semiconductor layer in the organic thin film transistor of *Jackson*. Accordingly, in view of *Ueda*'s disclosure, it would not be obvious to one skilled in the art to use the "intermediates" of the salts in the light emission layer.

Furthermore, the field-effect mobility of electrons of the claimed heterocyclic compounds is recited as  $1.0 \times 10^{-3} \text{ cm}^2/\text{Vs}$  or more (see claim 1). Metal salts, like those disclosed by *Ueda*, are known for their low field-effect mobility.<sup>2</sup> Accordingly, not only does *Ueda* only potentially suggest the use of salts of the heterocyclic compounds (not the intermediates of those salts), but the use of said salts would not satisfy the claimed field-effect mobility requirement of the heterocyclic compounds. Accordingly, the combination of *Ueda* with the other cited references still does not disclose or suggest the claimed heterocyclic compounds (non-salts) and/or the claimed field-effect mobility.

With respect to the alleged obviousness of the claimed "channel length", Applicants again submit that a person skilled in the art would not be motivated to lengthen the channel length of the organic light emitter of *Jackson* according to the disclosure of *Klauk* because (i) *Klauk* does not teach to lengthen the channel length and (ii) the device structure of *Jackson* is significantly different from the structure of *Klauk*.<sup>3</sup>

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<sup>2</sup> See Remarks filed April 2, 2008 (page 10, lines 7-18) wherein low field-effect mobilities of several metal complexes known in the art are, for example,  $3 \times 10^{-6} \text{ cm}^2/\text{Vs}$ ,  $4 \times 10^{-8} \text{ cm}^2/\text{Vs}$ ,  $2.9 \times 10^{-4} \text{ cm}^2/\text{Vs}$  and  $2.4 \times 10^{-5} \text{ cm}^2/\text{Vs}$ .

<sup>3</sup> See Remarks filed January 9, 2009 (page 11, line 3, to page 15, line 3) for detailed discussion of points (i) and (ii) and how they relate to field-effect mobility, along with an explanation of the calculations related to field-effect mobility.

Moreover, Applicants again bring to the Examiner's attention the following:

(1) Modifying the organic light emitter of *Jackson* by replacing Alq with *Ueda's* salt compounds does not lead to the transistor of amended claim 1 for the additional reason that the pentacene layer remains as the organic semiconductor layer. The organic light emitter of *Jackson* comprises an organic semiconductor layer (pentacene layer) and an organic light emitting layer (Alq layer) (see Summary of the Invention), and the functions of these two layers are clearly different. Also, *Jackson* nowhere indicates that the organic semiconductor layer includes a light emitting material.

(2) The transistor of the claimed invention exhibits unexpectedly high on/off ratios. The lowest on/off ratio confirmed among Examples 1-92 is  $3.5 \times 10^6$  of Example 35, and an even higher on/off ratio is confirmed in the other Examples. In contrast, *Jackson* is silent with respect to on/off ratio, and the OTFTs of *Klauk* exhibit on/off ratios between  $10^5$  and  $10^6$ . Accordingly, the claimed invention clearly exhibits unexpected effects.

Thus, as described above, since (a) *Ueda* only discloses/suggests the use of a salt of the anion of a heterocyclic compound and a metal cation, (b) such metal salts as described *Ueda* do not meet the claimed field-effect mobility limitation of the claimed heterocyclic compounds, (c) the device structures of *Jackson* and *Klauk* are significantly different, (d) *Klauk* does not actually suggest lengthening channel length, (e) *Jackson* does not suggest the use of heterocyclic compounds of claimed formulas (I)-(VII), and (f) Applicants' claimed transistor exhibits unexpectedly high on/off ratios, the cited art of record does not render obvious Applicants' claims. Accordingly, Applicants request withdrawal of the obviousness rejections in view of *Jackson* and *Klauk* in combination with *Ueda*.

**Conclusion**

For the reasons discussed above, Applicants submit that all now-pending claims are in condition for allowance. Applicants respectfully request the withdrawal of the rejections and passage of this case to issue.

Respectfully submitted,

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